Q22 – DATRAN II *eXcel*

Owners Manual

Manual Revision No. 1.03
Dated November 2001

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REVISION DETAILS

1.01 - Apr 2000	Original.
1.02 - Nov 2000	Pages 31 & 32 - Analog output configuration tables J2 jumper positions corrected.
1.03 – Nov 2001	Power supply connector labeling amended.

TABLE OF CONTENTS

INTRODUCTION

This revision 1.03 manual is for use with the Q22 – DATRAN II *eXcel* module up to Rev B printed circuit boards.

Q22 – DATRAN *eXcel* Module.

The Product

The Q22 - DATRAN *eXcel* Module combines a completely new state of the art Q03 – 16 Bit Processor and a new Q22 DATRAN *eXcel Motherboard.* The whole module is built with surface mount technology allowing greater

features and functionality to be built into the module. Q03 – 16 Bit Processor uses Flash memory and fully battery backed up SRAM. The module presents versatility and high density I/O in a compact unit. Industry compliance standards such as CE and Ctick have formed part of the design and manufacturing considerations.

The Q22 - DATRAN *eXcel* Module is the next generation in intelligent remote modules, that may be used either as remote units communicating with a SCADA base station or in standalone point to point arrangements.

The Online Diagnostics & Configuration windows application is available for use on PC's. laptops or notebooks, and a future version will be made available for CE devices.

What's in this Manual

This manual contains the following sections:

- The Functionality section describes the features and functions of the various components of the Q22 - DATRAN *eXcel* Module.
- The Configuration section explains how to configure the various hardware settings on the Q22 - DATRAN *eXcel* motherboard to suit its' specific application.
- The Connections section explains how to inter-connect the Q22 - DATRAN *eXcel* module to other devices.
- The Technical Notes section describes the electrical interfaces embedded in the Q22 - DATRAN *eXcel* motherboard.
- At the end of this manual you will find the following sections - Specifications, Warranty details and a 'Quick Find Index' to help in finding information in this manual.

Throughout the manual ***NOTE***'s and ***TIP***'s (shown in green italic letters) are included to give related suggestions, explanations and additional information, etc.

The complete packaged Q22 - DATRAN *eXcel* motherboard with integrated Q03 – 16 Bit Processor is referred to as the Q22 Module throughout this manual.

The Q22 - DATRAN *eXcel* motherboard is referred to as the Q22 - Motherboard throughout this manual.

QTech Data Systems Limited is referred to as QTech throughout this manual.

Additional Information

In conjunction with this manual the following manuals should also be referred to:

- The Q03 - 16 Bit Processor manual.
- The Q90 – Online Diagnostics & Configuration Reference manual.

Precautions

The power should be removed from the module by removing the power connector before setting up and making any adjustments to the module.

The Q22 - DATRAN *eXcel* Module incorporates static discharge sensitive devices. Normal Anti Static Discharge precautions should be employed when setting up and making any adjustments to the module.

An anti-static wristband should be worn and the earth connection of this wristband should be connected to the terminal marked 'EARTH' on the Q22 - DATRAN *eXcel* module before any adjustments are made.

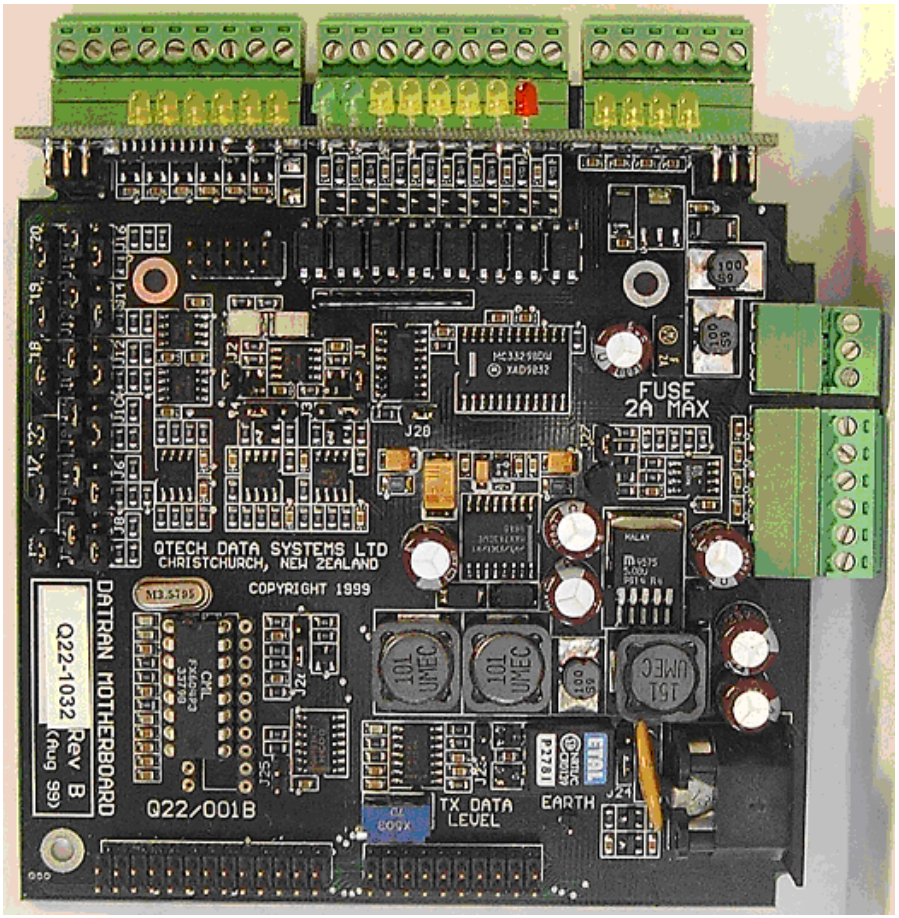
When re-installing the Q03 - 16-Bit Processor module onto the Q22 DATRAN *eXcel* motherboard check to ensure that the module is correctly seated on the connectors. That is, that the connectors are not misaligned.

FUNCTIONALITY

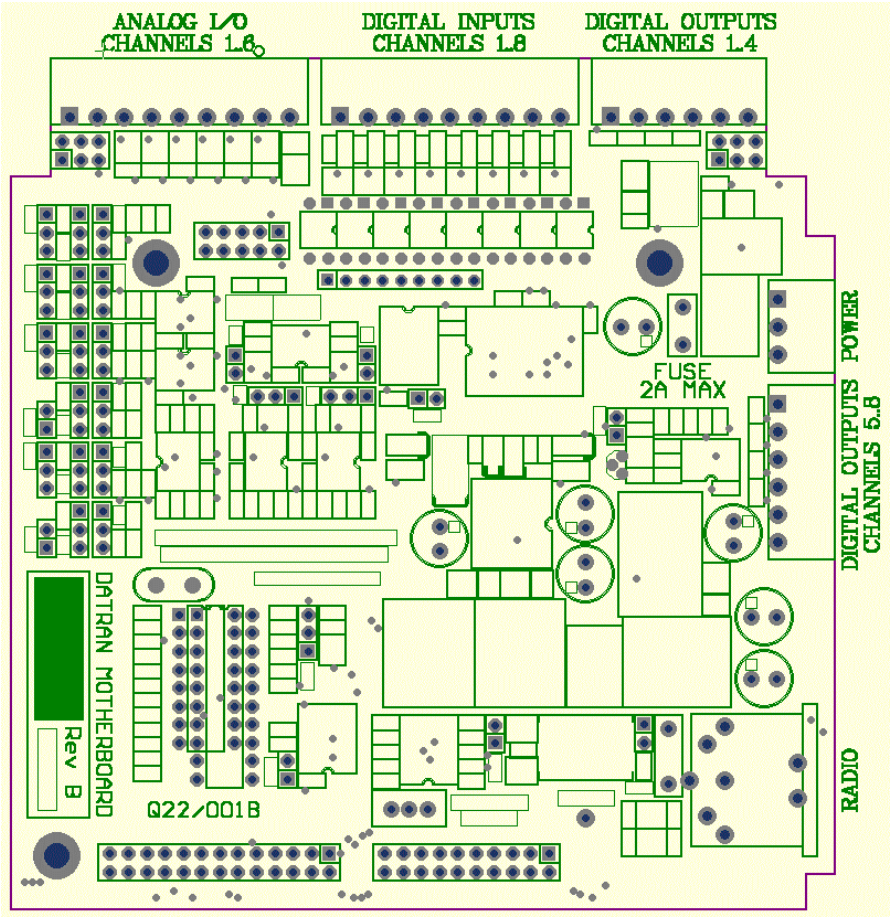
This section describes the functions and facilities of the Q22 Module.

Functional Descriptions

The photograph and diagram below shows the generalised layout of the Q22 DATRAN motherboard and can be used to locate and identify the various parts and functions detailed in this section.



Q22 – DATRAN *eXcel* Motherboard



Q22 – DATRAN *eXcel* Motherboard

This manual describes the hardware functions of the Q22 Module. Many of these functions inter-relate with the application software. Reference should be made to the Online Configuration & Diagnostic Reference manual.

System Status LEDs

There are 8 system status LED's on the front panel of the Q22 module. These system status LED's are used to indicate the following status and conditions:

ON This green status LED is on whenever power is applied to the Q22 Module and the module is not in low battery detect shut down mode. When the correct supply voltage is applied to the Q22 Module and this LED is not ON it could indicate that the internal fuse has blown.

OK This green status LED flashes at a slow regular interval to indicate that the Q03 – 16 Bit Processor's central processing unit is operating correctly. This LED will flash 6 times rapidly whenever a system reset occurs. System resets occur at system power up and whenever the reset button is pressed or the Q03 – 16 Bit Processor's central processing unit's watch dog timer times out.

IP This yellow LED flashes on for approximately 0.5 seconds every time a valid communications packet is received for this module address from another module on the RS485 Intelligent Peripheral buss.

MU This yellow LED turns on whenever the modem's attached radiotelephone mute gate opens. That is, the radiotelephone channel is busy. The Q22 Module will not transmit data when the **MU** (mute) LED is on.

Rx This yellow LED turns on whenever a valid data carrier is detected from the modem.

KY This yellow LED turns on whenever the modem's attached radiotelephone's transmitter is requested to be turned on.

TX This yellow LED turns on whenever the modem is generating transmit carrier and data to the radiotelephone.

ER This red LED is used to flash coded error messages. These lights will be extinguished when no error condition exists. Whenever an error condition occurs these lights will flash ON and OFF. The number of times the light flashes ON is the error function code. Each error code is separated by a 2 second OFF period thus allowing for multiple error codes to be flashed.

Error Codes

The red error LED described above can be programmed via the Online Diagnostics & Configuration program to indicate one or more error/fault conditions.

The following is a list of the number of error light flashes for each of the error/fault codes:

1. Main battery failure
2. Clock battery low
3. Main Base communications has failed.
4. I.P.B. communications failure
5. One or more real digital outputs has failed.
6. One or more Analog input is out of range
7. The DLP is not loaded or corrupted.

Power Supply

The Q22 Module is designed to operate with DC power supply voltages of nominally 12 or 24 volt. The Q22 Module will operate on any DC power supply voltage within the range 11 to 28 volts. The Q22 Module draws approximately 90mA at 12 volts and 60mA at 24.0 volts power supply input voltages.

The power connector is located on the bottom panel of the Q22 Module and is labeled **'PWR'**. The connections to the power connector are:

G	Ground, the negative lead of the power supply.
+	The positive lead of the power supply
C	The switched positive output to auxiliary equipment.

Note *The Q22 Module has a 2 amp fuse on the Q22 Motherboard to protect the unit under fault conditions or when reversed polarity or over-voltage power supplies are connected to the module. Refer to the Technical Notes for details on how to replace this fuse.*

This 2 amp fuse limits the available switched positive output on the '+' connectors to approximately 1.5 amps.

The DC power supply to the Q22 Module must be adequately smoothed and be free from noise and voltage transients. Where the DC supply is derived from the AC mains, or batteries with an associated AC mains battery charger these devices must comply with the relevant electrical regulations.

In many applications the Q22 Module is operated from power supply systems with a 12V or 24V standby battery. In the event of the main power supply failing and the standby battery becoming discharged the Q22 Motherboard has a low battery detection circuit. This circuit turns off the

internal power supply of the Q22 Module to prevent erratic operation of the Q22 Module and to prevent the battery from being totally discharged

The low battery detection modes voltages are:

12V Module OFF at 10.5 volts and back on at 11.5 volts.
24V Module OFF at 21.0 volts and back on at 23.0 volts.

The Q22 Module also has an optional software controlled low battery alarm. This alarm turns on when the battery falls below 11.5/23.0 volts and turns off again when the battery rises above 12.5/25 volts for 12/24 volts power supplies respectively.

Digital Inputs

The Q22 Module has 8 digital input channels. These are available at a 9 way connector labeled **'DIGITAL IN'** on the front panel of the Q22 Module. The digital input channels are numbered 1 to 8. The terminal labeled **'G'** is a system ground connection. Each digital input channel has an associated green channel status LED that turns on when that channel is in the ON state.

- A digital input channel is in the ON state when the corresponding input terminal on the digital inputs connector is grounded, i.e. connected to the **'G'** terminal on the digital inputs connector. The digital input channel's associated green status LED will be ON.
- A digital input channel is in the OFF state when the corresponding input terminal on the digital inputs connector is open circuit or at the supply voltage potential. The digital input channel's associated green status LED will be OFF.

Note *The input voltage to any digital input should not be allowed to go above the module's power supply voltage.*

The digital input can be switched with a variety of devices. These can include mechanical switches, solid-state switches, transistors, transducers, etc.

The digital input channels are sampled every 100mS by the processor therefore a given channel input state must be maintained for at least 100mS for the state to be recognized.

Digital input channel No. 8 can be configured for use as a high speed pulse counting and accumulation channel. Please contact QTech Data Systems Limited for application specific details.

The 8 green status LED's associated with each of the digital input channels are driven by the central processor. Each individual status LED will turn on to indicate that an ON state has been recognized by the central processor for the associated digital input channel.

Digital Outputs

The Q22 Module has 8 digital output channels:

- Digital output channels 1 to 4 are available at a 6 way connector labeled '**DIGITAL OUT**' on the front panel of the Q22 Module. The digital output channels are numbered 1 to 4. The terminals labeled '**+**' are connected to the switched positive rail of the module's power supply. Digital output's channels 1 to 4 have 4 associated yellow LEDs that turn on when that channel is in the ON state.
- Digital output channels 5 to 8 are available at a 6 way connector labeled '**AUX OUT**' on the bottom panel of the Q22 Module. The digital output channels are numbered 5 to 8. The terminals labeled '**+**' are connected to the switched positive rail of the module's power supply. Digital output channels 5 to 8 do not have status LED indicators.

In the ON state a digital output channel is switched to ground. In the OFF state a digital output channel is open circuited. The digital output channels are capable of switching 1 amp at up to 26.5 volts. The voltage into a digital output channel when the channel is OFF is clamped to 65 volts. This eliminates the need for reversed biased diodes across inductive loads.

Note *The total switching current for all digital output channels is limited to approximately 1.5 amps by the Q22 Module internal 2 amp fuse.*

The digital output channels have built in failsafe functions that protect and report digital output malfunctions. These include:

Output Protection Each individual output circuit is protected against over-voltage at input voltages greater than typically 28 to 36 volts with automatic shut down and soft restart when the voltage returns to normal. Similarly each output has over-current shut down at typically 3 to 6 amps with additional over-temperature shut down functions. (These functions make the outputs reasonably indestructible.)

Over-Current Recovery When jumper J28 is installed an over-current fault on any output channel will cause that channel to turn OFF and remain OFF until the over-current fault is removed and the central

processor resets the channel by turning it OFF. This is the default configuration.

When jumper J28 is not installed an over-current fault on any output channel will cause that output channel to go into current limit mode of approximately 0.5 amps. The output channel will return to normal operation when the over-current fault is removed, provided thermal shut down has not occurred.

Open Circuit Detection When the output channel is turned OFF a sensing current of approximately 50uA flows through the load and is used to detect open circuited loads.

Failsafe Fault Reporting

The open circuited load, short circuited load, over-current, over-voltage and thermal shutdown faults are reported back to the central processor. These failsafe faults can be used by DLP's and/or can be forwarded to other modules or remote base stations.

On output channels 1 to 4 any of the above faults will cause the associated yellow status LED to flash indicating a channel fault.

Analog Inputs

The Q22 Module has 6 Analog input channels. These are available at a 9 way connector labeled **'ANALOG I/O'** on the front panel of the Q22 Module. The Analog channels are numbered 1 to 6. The terminal labeled **'G'** is a system ground connection. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply. Each Analog channel has an associated yellow status LED to show the state of the Analog channel.

Note *Analog channels 5 & 6 can be configured individually as either input or output channels.*

Each yellow status LED shows the following channel status:

OFF Indicates that the Analog input is at 0V/0mA dependent upon the input mode configured. Or less than 4mA in 4 to 20mA current input mode.

ON Indicates that the Analog input is within the specified voltage or current range dependent upon the input mode configured.

FLASHING Indicates that the Analog input is at full scale input of 5V/10V/20mA or higher dependent upon the input mode configured.

The Q22 Module's 6 Analog channels can each be individually configured as single ended voltage or current inputs. Channels 1 & 2 and/or 3 & 4 can be configured together to form 2 differential voltage or current input channels.

*NOTE: Single ended input means that the input voltage or current is referenced to ground. That is the negative side of the input is at ground (earthed) potential. (The **'G'** terminal on the Analog front panel connector.)*

Differential Analog inputs provide for none ground referenced negative inputs and provide up to 10 volts common mode rejection on Analog input signals.

Differential inputs can also be used for 20mA current loop applications allowing the Q22 Module to be included in a multi-drop 20mA current loop application.

See Technical Notes section for further details.

Analog Input Ranges

The Analog inputs channels can be individually configured for 4 different voltage and current input ranges. These are:

- 0 to 5 volts
- 0 to 10 volts
- 0 to 20mA
- 4 to 20mA.

Note In any Analog input configuration the input voltage to any Analog input channel should not be allowed to go above 15 volts positive, or below 0 volts, i.e. negative.

Analog Outputs

The Q22 Module has 2 Analog output channels. These are available at a 9 way connector labeled **'ANALOG I/O'** on the front panel of the Q22 Module. The channels are numbered 5 & 6. The terminal labeled **'G'** is a system ground connection. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply. The 2 Analog output

channels have an associated yellow channel status LED to show the state of the associated Analog output channel.

Note *Analog channels 5 & 6 can be configured individually as either input or output channels.*

Each Analog output yellow channels status LED shows the following channel status:

OFF Indicates that the Analog output is at 0V/0mA dependent upon the output mode configured.

ON Indicates that the Analog output is within the specified voltage or current range dependent upon the output mode configured.

FLASHING Indicates that the Analog output is at full scale output of 5V/10V/20mA dependent upon the output mode configured.

The 2 Analog output channels can each be individually configured as single ended voltage or current outputs.

Analog Output Ranges

The Analog output channels can be individually configured for 4 different voltage and current output ranges. These are:

- 0 to 5 volts
- 0 to 10 volts
- 0 to 20mA
- 4 to 20mA.

Note *When the analog output channels are configured as voltage output channels the output impedance is very low. Output currents in excess of 100mA can damage the Analog output channel.*

Modem

The Q22 Motherboard has a built in inter-changeable 300 or 1200 baud modem. This modem is used for radio or direct line communications between the Q22 Module and a base station or specialized communications modules.

Note *The radio modem port is not type approved for direct connection to a Telecom line.*

Reset Switch

The Q22 Module has a reset switch located on the bottom panel of the module accessible through a hole labeled '**RESET**'. This reset button can be used to globally reset the Q22 Module.

A global reset of the Q22 Module will reset many of the hardware peripherals in the module and also re-initialise the application software thus putting the Q22 Module into a known state. Under normal operating conditions the global reset is not required.

CONFIGURATION

This section describes how to configure the Q22 Motherboard via the various on-board configuration jumpers.

The power should be removed from the module by removing the power connector before carrying out any of the configurations detailed below.

The Q22 Module incorporates static discharge sensitive devices. Normal Anti Static Discharge precautions should be employed when setting up and making any adjustments to the module.

An anti-static wristband should be worn and the earth connection of this wristband should be connected to the terminal marked 'EARTH' on the Q22 Motherboard before any adjustments are made.

Configuration Jumper Functions

The following list describes the function of each of the configuration jumpers on the Q22 Motherboard:

J1 This jumper selects the output voltage range for Analog output channel No. 6. Close is 0 to 5V/0 to 20mA output range whilst open is 0 to 10V output range.

J2 This jumper selects the output voltage range for Analog output channel No 5. Close is 0 to 5V/0 to 20mA output range whilst open is 0 to 10V output range.

J3 This 2 way jumper selects the output mode of Analog output channel No 6. Pins 1 & 2 closed is current output mode whilst 2 & 3 closed is voltage output mode.

J4 This 2 way jumper selects the output mode of Analog output channel No 5. Pins 1 & 2 closed is current output mode whilst 2 & 3 closed is the voltage output mode.

J5 This 2 way jumper selects the single ended input range of Analog input channel No. 2. Pins 1 & 2 closed is 0 to 10V input range, whilst 2 & 3 closed is 0 to 5V/0 to 20mA input range.

J6 This 2 way jumper selects the single ended input mode of Analog input channel No. 2. Pins 1 & 2 closed is 0 to 20mA input mode, 2

& 3 closed is 0 to 10V input mode, whilst jumper open is 0 to 5V input mode.

J7 This 2 way jumper selects the single ended input range of Analog input channel No. 1. Pins 1 & 2 closed is 0 to 10V input range, whilst 2 & 3 closed is 0 to 5V/0 to 20mA input range.

J8 This 2 way jumper selects the single ended input mode of Analog input channel No. 1. Pins 1 & 2 closed is 0 to 20mA input mode, 2 & 3 closed is 0 to 10V input mode, whilst jumper open is 0 to 5V input mode.

J9 This 2 way jumper selects the single ended input range of Analog input channel No. 3. Pins 1 & 2 closed is 0 to 10V input range, whilst 2 & 3 closed is 0 to 5V/0 to 20mA input range.

J10 This 2 way jumper selects the single ended input mode of Analog input channel No. 3. Pins 1 & 2 closed is 0 to 20mA input mode, 2 & 3 closed is 0 to 10V input mode, whilst jumper open is 0 to 5V input mode.

J11 This 2 way jumper selects the single ended input range of Analog input channel No. 4. Pins 1 & 2 closed is 0 to 10V input range, whilst 2 & 3 closed is 0 to 5V/0 to 20mA input range.

J12 This 2 way jumper selects the single ended input mode of Analog input channel No. 4. Pins 1 & 2 closed is 0 to 20mA input mode, 2 & 3 closed is 0 to 10V input mode, whilst jumper open is 0 to 5V input mode.

J13 This 2 way jumper selects the single ended input range of Analog input channel No. 5. Pins 1 & 2 closed is 0 to 10V input range, whilst 2 & 3 closed is 0 to 5V/0 to 20mA input range.

J14 This 2 way jumper selects the single ended input mode of Analog input channel No. 5. Pins 1 & 2 closed is 0 to 20mA input mode, 2 & 3 closed is 0 to 10V input mode, whilst jumper open is 0 to 5V input mode.

J15 This 2 way jumper selects the single ended input range of Analog input channel No. 6. Pins 1 & 2 closed is 0 to 10V input range, whilst 2 & 3 closed is 0 to 5V/0 to 20mA input range.

J16 This 2 way jumper selects the single ended input mode of Analog input channel No. 6. Pins 1 & 2 closed is 0 to 20mA input mode, 2 & 3 closed is 0 to 10V input mode, whilst jumper open is 0 to 5V input mode.

J17 This 2 way jumper selects the input mode of Analog input channels No's 1 & 2. Pins 1 & 2 closed is one differential input channel. Pins 2 & 3 closed is two single ended input channels.

J18 This 2 way jumper selects the input mode of Analog input channels No's 3 & 4. Pins 1 & 2 closed is one differential input channel. Pins 2 & 3 closed is two single ended input channels.

J19 This 2 way jumper selects the input/output mode of Analog channel 5. Pins 1 & 2 closed is output mode, whilst 2 & 3 closed is input mode.

J20 This 2 way jumper selects the input/output mode of Analog channel 6. Pins 1 & 2 closed is output mode, whilst 2 & 3 closed is input mode.

J21 This jumper selects the single ended/differential input mode for Analog input channels 1 & 2. Closed is single ended input for channel 1, whilst open is differential input for channels 1 & 2.

J22 This jumper selects the single ended/differential input mode for Analog input channels 3 & 4. Closed is single ended input for channel 3, whilst open is differential input for channels 3 & 4.

J23 This jumper increases the received gain of the modem signals when used with a 300 baud modem chip. Closed is increased receive gain for 300 baud modem chip. Open is normal receive gain for 1200 baud modem chip.

J24 This jumper sets the line terminating impedance of the radio/line modem. Closed is 600 ohms termination, whilst open is un-terminated.

J25 This jumper selects the 300 baud modem chip answer or originate mode. Closed is answer mode. Open is originate mode.

J26 This 2 way jumper selects the modem carrier detect source. Pins 1 & 2 closed selects the 1200 baud modem chip. Pins 2 & 3 closed selects the 300 baud modem chip.

J27 This jumper selects the module's low battery/power supply detect voltage range. Closed is 10.5V low battery detection, whilst open is 21V low battery detection.

J28 This jumper selects the digital output channels over-current mode. Closed is channel turns OFF in over-current mode, whilst open is channels goes into current limit in over-current mode.

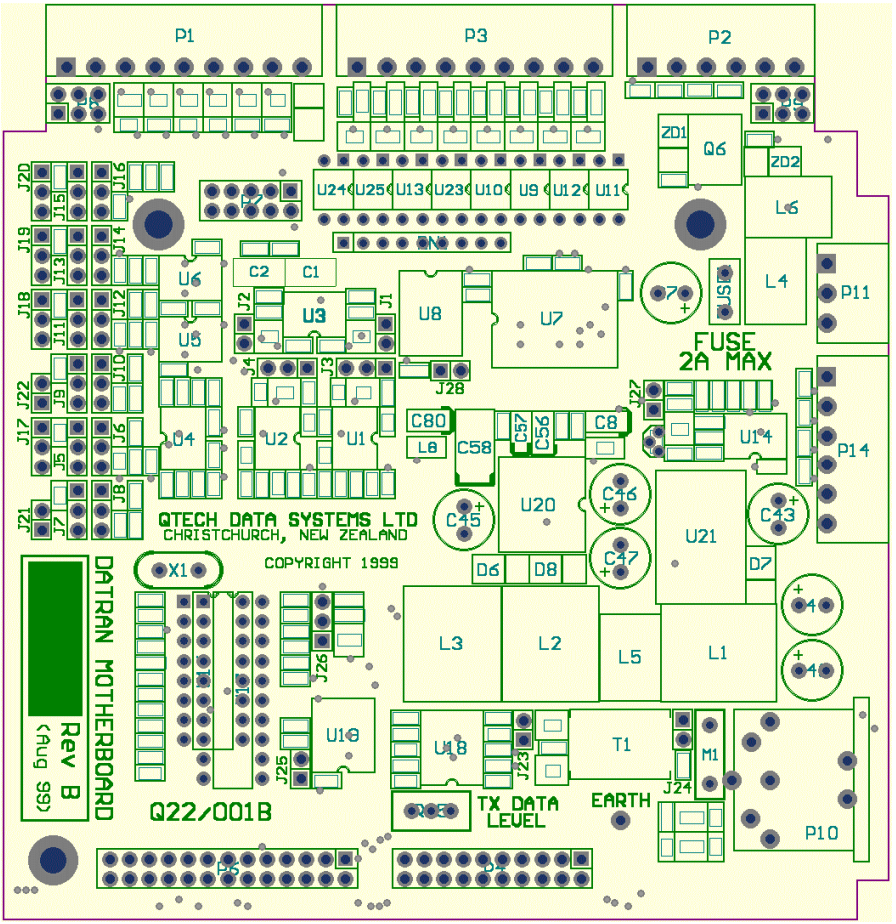
Note: A jumper is closed when a jumper shorting link is installed on the jumper. A jumper is open when a jumper shorting link is removed/not installed.

A two way jumper has three pins so that the jumper shorting link can be installed one of two ways.

Configuration Jumper Settings

The following section describes the function and settings of each of the configuration jumpers on Q22 Motherboard.

The diagram below shows the general location of each of the configuration jumpers on the Q22 Motherboard. The precise location, orientation and identification of jumper pin numbers is best done by referring to the diagrams in this manual and referring to an actual Q22 Motherboard.



Location of Configuration Jumpers on Q22 motherboard.

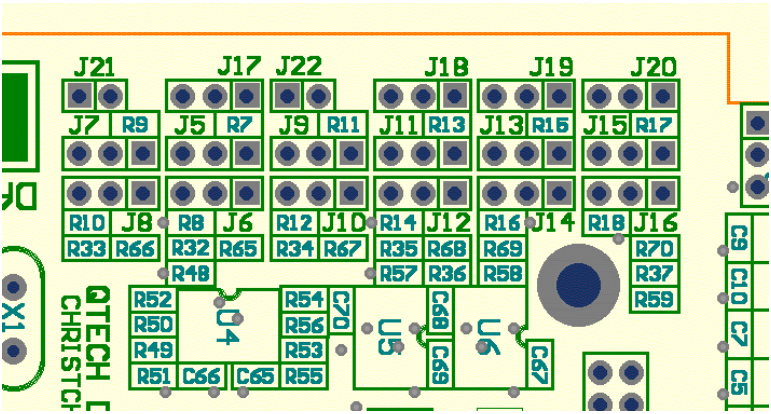
In the diagrams shown below the square pad on each jumper header is pin No 1. The pins are numbered 1, 2, and 3 away from pin No 1. Orientation of pin No 1 of the jumpers on the actual Q22 Motherboard can vary.

TIP *A pair of fine pointed nosed pliers or tweezers can be used to remove and install the jumper shorting links. The jumper shorting links will only fit onto the jumper pins one way. Always check that they are seated properly.*

Unused or open jumper shorting links may be installed on only one pin of the jumper

Analog Input Configuration

The Analog input configuration jumpers are located at the top right hand side of the Q22 Motherboard as viewed with the front display panel to the right and the Q03 -16 Bit Processor board removed.



Analog input configuration jumpers.

The diagram above shows the location of the jumpers used to configure the Analog input channels. Each of the 2 or 3 pin jumper headers can be clearly seen. The square pad on each jumper header is pin No 1. The pins are numbered 1, 2, and 3 away from pin No 1. Orientation of pin No 1 of the jumpers on the actual Q22 Motherboard can vary.

Single Ended Input Configuration

The following tables show the jumper configurations for each of the 6 Analog channels when configured as single ended input channels.

*NOTE: Single ended input means that the input voltage or current is referenced to ground. That is the negative side of the input is at ground (earthed) potential. (The **'G'** terminal on the Analog front panel connector.)*

Channel No 1 – Single Ended Input			
	J7	J8	J21
0..5V	2 - 3	OPEN	INSTALL
0..10V	1 - 2	2 - 3	INSTALL
0..20mA	2 - 3	1 - 2	INSTALL

Channel No 2 – Single Ended Input			
	J5	J6	J17
0..5V	2 - 3	OPEN	2 - 3
0..10V	1 - 2	2 - 3	2 - 3
0..20mA	2 - 3	1 - 2	2 - 3

Channel No 3 – Single Ended Input			
	J9	J10	J22
0..5V	2 - 3	OPEN	INSTALL
0..10V	1 - 2	2 - 3	INSTALL
0..20mA	2 - 3	1 - 2	INSTALL

Channel No 4 – Single Ended Input			
	J11	J12	J18
0..5V	2 - 3	OPEN	2 - 3
0..10V	1 - 2	2 - 3	2 - 3
0..20mA	2 - 3	1 - 2	2 - 3

Channel No 5 – Single Ended Input			
	J13	J14	J19
0..5V	2 - 3	OPEN	2 - 3
0..10V	1 - 2	2 - 3	2 - 3
0..20mA	2 - 3	1 - 2	2 - 3

Channel No 6 – Single Ended Input			
	J15	J16	J20
0..5V	2 - 3	OPEN	2 - 3
0..10V	1 - 2	2 - 3	2 - 3
0..20mA	2 - 3	1 - 2	2 - 3

NOTE: When an Analog channel is to be configured for 4 to 20mA input – configure the channel's *jumpers for 0 to 20mA input, then, use the Online Diagnostics & Configuration program to configure the channels as 4 to 20mA. Refer to the Online Configuration & Diagnostic Reference manual for further details.*

Differential Input Configuration

Analog inputs channels 1 & 2, and/or 3 & 4 can be configured as differential inputs. When configured as differential inputs channels 1 and/or 3 are the positive inputs and channels 2 and/or 4 are the negative inputs respectively.

NOTE: Differential Analog inputs provide for non ground referenced negative inputs and provide up to 10 volts common mode rejection on Analog input signals.

Differential inputs can also be used for 20mA current loop applications allowing the Q22 Module to be included in a multi-drop 20mA current loop application.

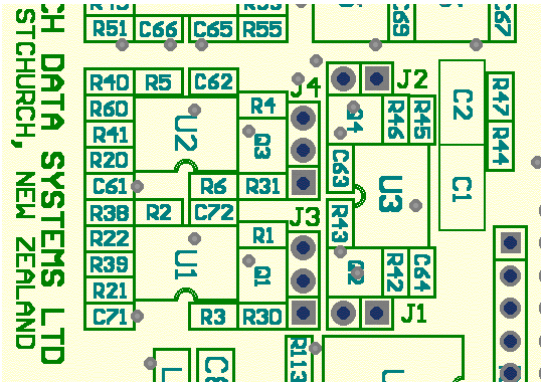
The following tables show the jumper configurations for configuring Analog input channels 1 & 2 and/or 3 & 4 as differential input channels: -

Channel No 1 & 2 – Differential Input				
	J7	J8	J17	J21
0..5V	2 - 3	OPEN	1 - 2	OPEN
0..10V	1 - 2	2 - 3	1 - 2	OPEN
0..20mA	2 - 3	1 - 2	1 - 2	OPEN

Channel No 3 & 4 – Differential Input				
	J9	J10	J18	J22
0..5V	2 - 3	OPEN	1 - 2	OPEN
0..10V	1 - 2	2 - 3	1 - 2	OPEN
0..20mA	2 - 3	1 - 2	1 - 2	OPEN

Analog Output Configuration

The Analog output configuration jumpers are located at the center upper right hand side of the Q22 Motherboard as viewed with the front display panel to the right and the Q03 -16 Bit Processor board removed.



Analog output configuration jumpers.

The diagram above shows the location of the jumpers used to configure the Analog output channels. Each of the 2 or 3 pin jumper headers can be clearly seen. The square pad on each jumper header is pin No 1. The pins are numbered 1, 2, and 3 away from pin No 1. Refer to page 28 for the location of jumpers J19 and J20.

The following two tables show the jumper configurations for Analog channels 5 and 6 when configured as single ended output channels.

*NOTE: Single ended output means that the output voltage or current is referenced to ground. That is the negative side of the output is at ground (earthed) potential. (The **'G'** terminal on the Analog front panel connector.)*

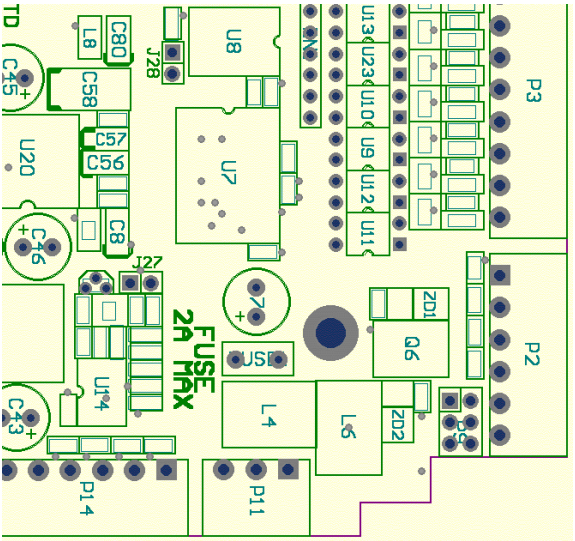
Channel No 5 – Single Ended Output			
	J2	J4	J19
0..5V	OPEN	2 - 3	1 - 2
0..10V	INSTALL	2 - 3	1 - 2
0..20mA	OPEN	1 - 2	1 - 2

Channel No 6 – Single Ended Output			
	J1	J3	J20
0..5V	OPEN	2 - 3	1 - 2
0..10V	INSTALL	2 - 3	1 - 2
0..20mA	OPEN	1 - 2	1 - 2

NOTE: When an Analog output channel is to be configured for 4 to 20mA output – configure the channel's jumpers for 0 to 20mA output, then, use the Online Diagnostics & Configuration program to configure the Analog output channel as 4 to 20mA.

Digital Output Over-Current

Jumper J28 is used to select the digital outputs global over-current mode. Jumper J28 is located at the center lower right hand side of the Q22 Motherboard as viewed with the front display panel to the right and the Q03 -16 Bit Processor board removed.



Location of Digital Outputs Over-Current Jumper J28.

When jumper J28 is installed an over-current fault on any of the digital output channels will cause that channel to turn OFF and remain OFF until

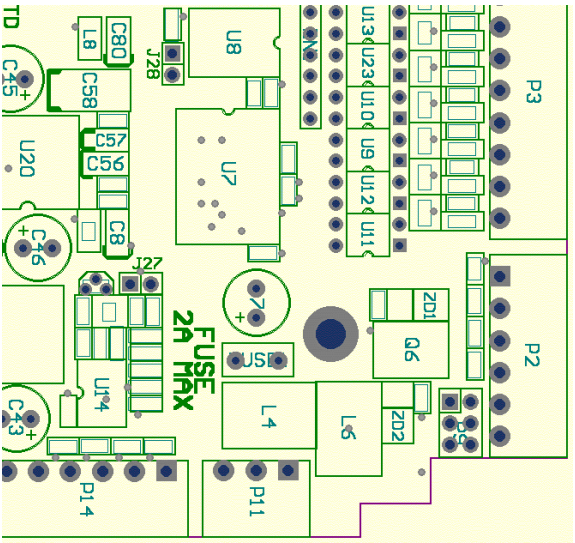
the over-current fault is removed and the central processor resets the channel by turning it OFF. This is the default jumper configuration.

When jumper J28 is not installed an over-current fault on any of the digital output channels will cause that output channel to go into current limit mode of approximately 0.5 amps. The output channel will return to normal operation when the over-current fault is removed, provided thermal shut down has not occurred.

Note *Refer to Digital Outputs in the Technical Notes on page 42 for further details*

Low Battery Detection

Jumper J27 is used to configure the module's low battery detect voltage mode. Jumper J27 is located at the lower middle side of the Q22 Motherboard as viewed with the front display panel to the right and the Q03 -16 Bit Processor board removed.



Location of Digital Outputs Over-Current Jumper J27.

The Q22 Motherboard incorporates a low battery detection circuit that automatically shuts down the Q22 Module and associated peripherals to prevent total battery discharging and protect against under-voltage erratic

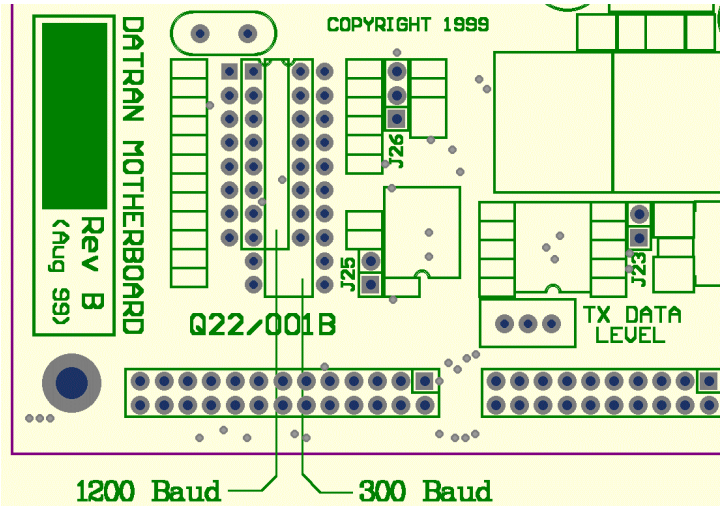
operation of the system. Jumper J27 is used to configure the low voltage detection trip voltage.

When jumper J27 is installed the trip voltage is 10.5 volts and when jumper J27 is open the trip voltage is 21 volts.

Note *Refer to the Low Power Drop-Out in the Technical Notes on page 52 for further details*

Radio Modem Configuration

The radio modem configuration jumpers are located at the bottom left hand side of the Q22 Motherboard as viewed with the front display panel to the top and the Q03 -16 Bit Processor board removed. The diagram below shows the location of the modem jumpers.



Location of Radio Modem Jumpers.

The Q22 Motherboard has provision for the installation of either an FX604 1200 baud modem chip, or an MC145443 300 baud modem chip. Each of these modem chip installations is detailed below.

1200 Baud Modem

In 1200 baud applications of the Q22 Module an FX604 modem chip must be installed in the location shown in the above diagram. The FX604 is a 16

pin DIP package that plugs into the DIP pin headers with the chip offset to the left and pin 1 at the upper left as shown in the diagram above.

The jumpers J23, J25 & J26 must be configured as shown in the table below:

FX604 – 1200 Baud Modem			
	J23	J25	J26
1200 Baud	OPEN	OPEN	1 & 2

300 Baud Modem

In 300 baud applications of the Q22 Module an MC145443 modem chip must be installed in the location shown in the above diagram. The MC145443 is a 20 pin DIP package that plugs into the DIP pin headers with the chip offset to the right and pin 1 at the upper left as shown in the diagram above.

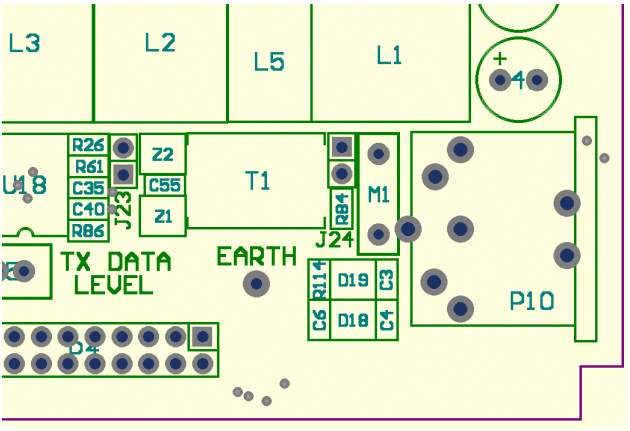
The jumpers J23, J25 & J26 must be configured as shown in the table below:

MC145443 – 300 Baud Modem			
	J23	J25	J26
Answer	INSTALL	INSTALL	2 & 3
Originate	INSTALL	OPEN	2 & 3

Note Base station and the slave communications modules are always originate, RTU's are always answer mode.

Line Termination

Jumper J24 is used to select the line termination of 600 ohms. The jumper J24 is located at the bottom right hand side of the Q22 Motherboard as viewed with the front display panel to the top and the Q03 -16 Bit Processor board removed. The diagram below shows the location of the jumper J24.



Location of Line Termination Jumper J24.

When jumper J24 is installed the modem line is terminated in a 600 ohm impedance. When jumper J24 is open the modem line is high impedance. The default configuration of this jumper is open.

CONNECTIONS

This section describes the function and connections to the various connectors on the Q22 Module.

Power Supply

The Q22 Module is designed to operate with DC power supply voltages of nominally 12 or 24 volt. The Q22 Module will operate on any DC power supply voltage within the range 11 to 28 volts. The Q22 Module draws approximately 90mA at 12 volts and 60mA at 24.0 volts power supply input voltages.

The power connector is located on the lower panel of the Q22 Module and is labeled **'PWR'**. The terminals of the power connector are:

G	Ground, negative lead of supply.
+	Positive lead of supply
C	Switched positive output to auxiliary equipment.

*Note the '**+**' switched positive output is also present on the '**+**' connectors of the **'ANALOG I/O'**, **'DIGTAL OUT'** and **'AUX OUT'** connectors. This ensures that attached peripheral devices also shut down during low battery shut down and therefore do not 'back feed' power to the Q22 Module.*

The switched positive output is capable of delivering approximately 1.5 amps. The switched positive output is protected by the Q22 Module's internal 2 amp fuse.

The DC power supply to the Q22 Module must be adequately smoothed and free from noise and voltage transients. Where the DC supply is derived from the AC mains, or batteries with an associated AC mains battery charger these devices must comply with the relevant electrical regulations.

Digital Inputs

The Q22 Module has 8 digital input channels. These are available at a 9 way connector labeled **'DIGITAL IN'** on the front panel of the Q22 Module. The digital input channels are numbered 1 to 8. The terminal **'G'** is a system ground connection.

- A digital input channel is in the ON state when the corresponding input terminal on the digital inputs connector is grounded, i.e. connected to the **'G'** terminal on the digital inputs connector.
- A digital input channel is in the OFF state when the corresponding input terminal on the digital inputs connector is open circuit or at the supply voltage potential.

Note *The input voltage to any digital input should not be allowed to go above the module's power supply voltage.*

The digital input can be switched with a variety of devices. These can include mechanical switches, solid-state switches, transistors, transducers, etc.

Digital Outputs

The Q22 Module has 8 digital output channels:

- Digital output channels 1 to 4 are available at a 6 way connector labeled **'DIGITAL OUT'** on the front panel of the Q22 Module. The digital outputs channels are numbered 1 to 4. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply.
- Digital output channels 5 to 8 are available at a 6 way connector labeled **'AUX OUT'** on the bottom panel of the Q22 Module. The digital outputs channels are numbered 5 to 8. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply.

In the ON state a digital output channel is shorted to ground. In the OFF state a digital output channel is open circuited. The digital output channels are capable of switching 1 amp at up to 26.5 volts. The output voltage is clamped at 65 volts during inductive switching eliminating the need for reversed biased diodes across inductive loads.

Note *The total digital switching current is limited to approximately 1.5 amps by the Q22 Module internal 2 amp fuse.*

The **'+'** switched positive output connector on the **'DIGTAL OUT'** connector should be used as the positive supply line to relays and similar devices connected to the digital outputs. This ensures that these devices also shut down during low battery shut down and therefore do not 'back feed' power to the Q22 Module.

Note *Relays and other control devices should be wired with consideration that their attached loads, will be off or in a safe state when the relay or controlling device is de-energised. This is the failsafe condition.*

Analog Inputs

The Q22 Module has 6 Analog input channels. These are available at a 9 way connector labeled **'ANALOG I/O'** on the front panel of the Q22 Module. The Analog input channels are numbered 1 to 6. The terminal labeled **'G'** is a system ground connection. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply.

Note *Analog channels 5 & 6 can be configured individually as either input or output channels.*

The Q22 Module's 6 Analog channels can be individually configured as single ended voltage or current inputs. Channels 1 & 2 and/or 3 & 4 can be configured together to form 2 differential voltage or current input channels.

*NOTE: Single ended input means that the input voltage or current is referenced to ground. That is the negative side of the input is at ground (earthed) potential. (The **'G'** terminal on the Analog front panel connector.)*

Differential Analog inputs provide for none ground referenced negative inputs and provide up to 10 volts common mode rejection on Analog input signals.

Differential inputs can also be used for 20mA current loop applications allowing the Q22 Module to be included in a multi-drop 20mA current loop application.

The **'+'** switched positive output terminal on the **'ANALOG I/O'** connector should be used as the positive supply line to loop powered analog devices used in conjunction with the Analog input channels. This ensures that these devices also shut down during low battery shut down and therefore do not 'back feed' power to the Q22 Module.

Note *In any Analog input configuration the input voltage to any Analog input channel should not be allowed to go above 15 volts positive, or below 0 volts, i.e. negative.*

As with any Analog measurement system, care must be taken in earthing of equipment to prevent earth loops. Use the **'G'** connector on the **'ANALOG I/O'** connector for all Analog ground signal return paths.

Analog Outputs

The Q22 Module has 2 Analog output channels. These are available at a 9 way connector labeled **'ANALOG I/O'** on the front panel of the Q22 Module. The Analog output channels are numbered 5 & 6. The terminal labeled **'G'** is a system ground connection. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply.

Note *Analog channels 5 & 6 can be configured individually as either input or output channels.*

Note *When the analog output channels are configured as voltage output channels the output impedance is very low. Output currents in excess of 100mA can damage the Analog output channel.*

As with any Analog measurement system, care must be taken in earthing of equipment to prevent earth loops. Use the **'G'** connector on the **'ANALOG I/O'** connector for all Analog ground signal return paths.

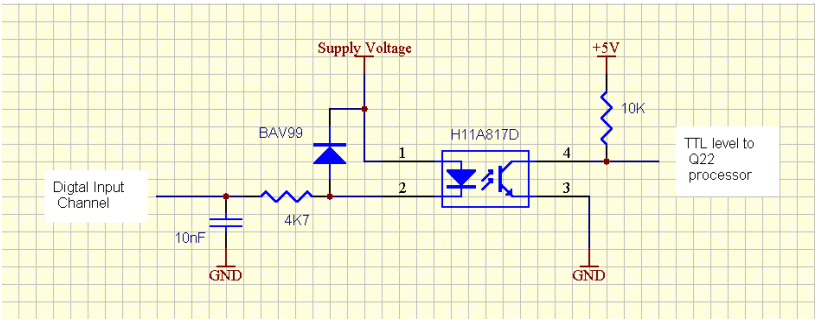
TECHNICAL NOTES

This section describes the technical aspects of interfacing various devices and user designed interfaces to the Q22 Module.

Digital Inputs

The Q22 Module has 8 digital input channels. These are available at a 9 way connector labeled **'DIGITAL IN'** on the front panel of the Q22 Module. The digital input channels are numbered 1 to 8. The terminal labeled **'G'** is a system ground connection. Each digital input channel has an associated green channel status LED that turns on when that channel is in the ON state.

- A digital input channel is in the ON state when the corresponding input terminal on the digital inputs connector is grounded, i.e. connected to the **'G'** terminal on the digital inputs connector. The digital input channel's associated green status LED will be ON.
- A digital input channel is in the OFF state when the corresponding input terminal on the digital inputs connector is open circuit or at the supply voltage potential. The digital input channel's associated green status LED will be OFF.



Circuit details of a Digital Input Channel.

The above circuit diagram shows the input circuit configuration of a digital input channel on the Q22 Motherboard. The digital input circuit is opto isolated from the main processor circuitry to prevent noise and voltage spikes entering.

The 4K7 resistor limits the current through the opto isolator while the 10nF capacitor filters noise from the input line. The BAV99 prevents input voltages spikes above the supply voltage from exceeding the reverse breakdown voltage of the opto isolator's LED.

When the module's supply voltage is 12 volts the digital input's ON state current to ground will be approximately 2.5mA, and with a module supply voltage of 24 volts the digital input's ON current to ground will be approximately 5mA.

The digital input can be switched with a variety of devices. These can include mechanical switches, solid state switches, transistors, transducers, etc.

The current transfer ratio of the H11A817D opto isolators is greater than 100% therefore allowing for a 50% safety margin a minimum of 1mA must flow through the opto isolator's LED to ensure reliable switching. This represents a maximum external switching device resistance of 5K with a module supply voltage of 12 volts and 10k with a module supply voltage of 24 volts.

Note *The input voltage to any digital input should not be allowed to go above the module's power supply voltage.*

The digital input channels are sampled every 100mS by the processor therefore a given channel input state must be maintained for greater than 100mS for the state to be recognized.

Digital input channel No. 8 can be configured for use as a high speed pulse counting and accumulation channel. Please contact QTech Data Systems Limited for application specific details.

The 8 green status LED's associated with each of the digital input channels are driven by the central processor. Each individual status LED will turn on to indicate that an ON state has been recognized by the central processor for the associated digital input channel.

Digital Outputs

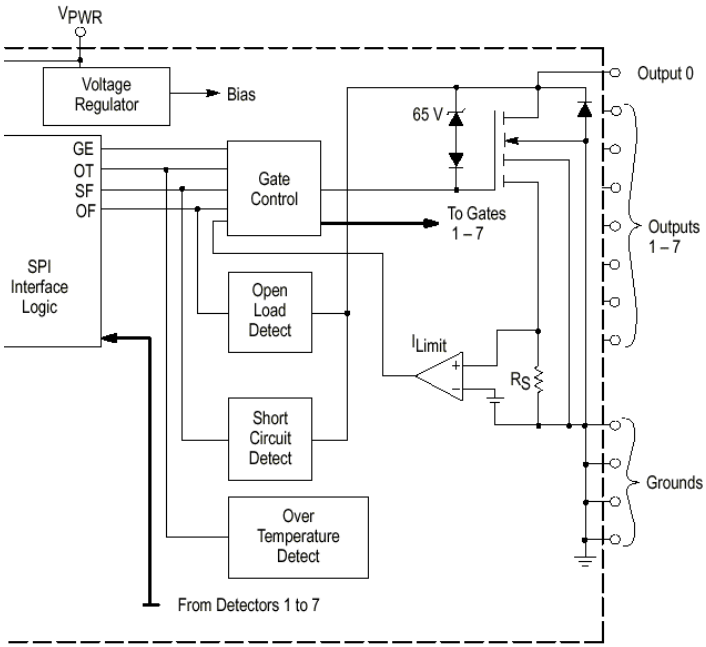
The Q22 Module has 8 digital output channels:

- Digital output channels 1 to 4 are available at a 6 way connector labeled '**DIGITAL OUT**' on the front panel of the Q22 Module. The digital outputs channels are numbered 1 to 4. The terminals labeled '**+**' are connected to the switched positive rail of the module's power supply. Digital output's channels 1 to 4 have 4

associated yellow LEDs that turn on when that channel is in the ON state.

- Digital output channels 5 to 8 are available at a 6 way connector labeled '**AUX OUT**' on the bottom panel of the Q22 Module. The digital outputs channels are numbered 5 to 8. The terminals labeled '**+**' are connected to the switched positive rail of the module's power supply. Digital output's channels 5 to 4 have 8 do not have status LED indicators.

In the ON state a digital output channel is shorted to ground. In the OFF state a digital output channel is open circuited.



Circuit details of a Digital Output Channel.

The above circuit diagram shows the output circuit configuration of a digital output channel on the Q22 Motherboard. The output circuit includes the following failsafe features.

MOSFET Output Transistors

The output MOSFET transistors have an ON resistance of typically 1 ohm and are capable of switching 3 amps at 5.5 to 26.5 volts. The output voltage is clamped at 65 volts during inductive switching eliminating the need for reversed biased diodes across inductive loads.

Note The total digital switching current is limited to approximately 1.5 amps by the Q22 Module internal 2 amp fuse.

Output Protection

Each individual output circuit is protected against over-voltage at input voltages greater than typically 28 to 36 volts with automatic shut down and soft restart when the voltage returns to normal. Similarly each output has over-current shut down at typically 3 to 6 amps with additional over-temperature shut down functions. (These functions make the outputs reasonably indestructible.)

Over-Current Recovery

When jumper J28 is installed an over-current fault on any output channel will cause that channel to turn OFF and remain OFF until the over-current fault is removed and the central processor resets the channel by turning it OFF. This is the default setting.

When jumper J28 is not installed an over-current fault on any output channel will cause that output channel to go into current limit mode of approximately 0.5 amps. The output channel will return to normal operation when the over-current fault is removed, provided thermal shut down has not occurred.

Open Circuit Detection

When the output channel is turned OFF a sensing current of approximately 50uA flows through the load and is used to detect open circuited loads.

Failsafe Fault Reporting

The open circuited load, short circuited load, over-current, over-voltage and thermal shutdown faults are reported back to the central processor. These failsafe faults can be used by DLP's and/or be forwarded to other modules or remote base stations.

On output channels 1 to 4 any of the above faults will cause the associated yellow status LED to flash indicating a channel fault.

Analog Inputs

The Q22 Module has 6 Analog input channels. These are available at a 9 way connector labeled **'ANALOG I/O'** on the front panel of the Q22 Module. The Analog input channels are numbered 1 to 6. The terminal labeled **'G'** is a system ground connection. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply. Each Analog input channel has an associated yellow channel status LED to show the state of the associated Analog input channel.

Note *Analog channels 5 & 6 can be configured individually as either input or output channels.*

Each Analog input yellow channels status LED shows the following channel status:

OFF Indicates that the Analog input is at 0V/0mA dependent upon the input mode configured. Or less than 4mA in 4 to 20mA current input mode. That is the ADC count value is zero.

ON Indicates that the Analog input is within the specified voltage or current range dependent upon the input mode configured. That is the ADC value is between 1 and 1022 counts.

FLASHING Indicates that the Analog input is at full scale input of 5V/10V/20mA or higher dependent upon the input mode configured. That is the ADC count value is equal to 1023, i.e. maximum count.

The Q22 Module has 6 Analog channels that can be individually configured as single ended voltage or current inputs. Channels 1 & 2 and/or 3 & 4 can be configured together to form 2 differential voltage or current input channels.

Analog to Digital Converter

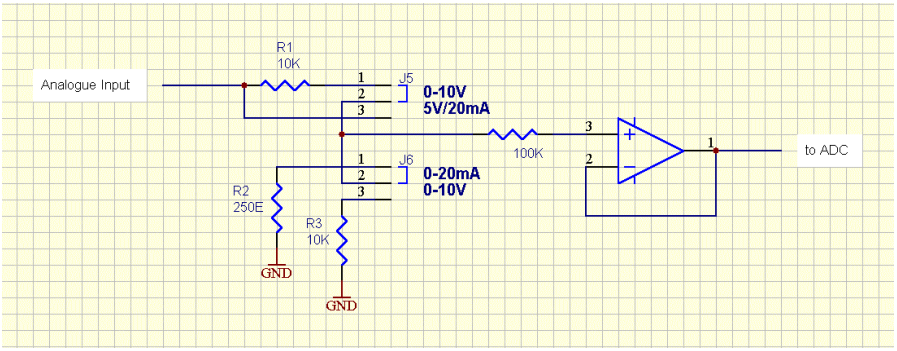
The Analog inputs are preconditioned to 0 to 5 volts as described below then fed to a high speed multi-channel averaging 10 bit resolution Analog to digital converter (ADC) on the Q03 – 16 bit Processor. The ADC includes a stable 5 volt reference to provide 0 to 5 volts input range representing a 0 to 1023 counts out.

Analog Calibration

To compensate for resistor tolerances and variations together with op-amp gain and offset variations the Q22 Module uses software algorithms to individually compensate and calibrate each Analog channel. The calibration algorithms correct for voltage offset, zero offset and gain offset. The calibration factors are stored in an EEPROM. Analog calibration is performed using the Q22 Configuration & Diagnostic functions.

Single Ended Inputs

The diagram below shows the single ended Analog input circuit. The circuit includes analog preconditioning networks and a unity gain op-amp that produce a scaled 0 to 5 volts output to the ADC.



Circuit details of Single Ended Analog Input Channel.

The following paragraphs describe the various single ended Analog input configurations:

0 to 5V In this configuration jumper J5 has pins 2 & 3 closed and jumper J6 is left open. The Analog input voltage is fed via a 100k resistor to the non-inverting input of the op-amp. In this configuration the input impedance is high and negligible current is drawn from the Analog source.

0 to 10V In this configuration J5 has pins 1 & 2 closed and jumper J6 pins 2 & 3 closed. Resistors R1 and R3 form a voltage divider that divides the Analog input voltage by 2 to produce a 0 to 5 volts input to the non-inverting input of the op-amp. In this configuration the input impedance is 20,000 ohms and the input current at 10 volts input is 500uA.

0 to 20mA In this configuration jumper J5 has pins 2 & 3 closed and jumper J6 pins 1 & 2 closed. The Analog input current flows through the 250 ohms resistor so that 0 to 20mA produces a voltage of 0 to 5 volts to the non-inverting input of the op-amp. In this configuration a voltage drop of 5 volts at 20mA is created in the 20mA loop by the Q22 Module.

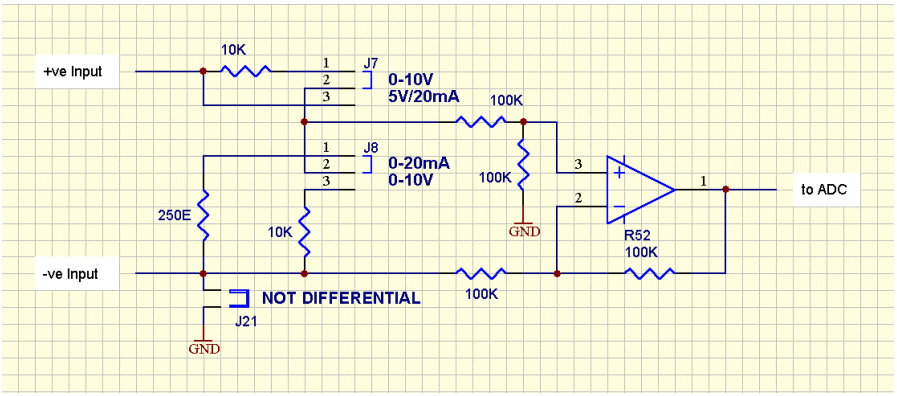
4 to 20mA The 4 to 20mA loop configuration is the same as the 0 to 20mA loop described above, except the central processor scales the output to 4 to 20mA range. This reduces the ADC resolution to 80% of the 1024 counts for full scale to 1 part in 800 counts.

Note *Each of the single ended Analog inputs are clamped with BAV99 high speed switching diodes to both ground and +15 volts to keep the input voltage to the op-amp in the range 0 to +15 volts. Analog input voltages outside 0 to +15 volts will cause the clamping diodes to conduct and draw current from the Analog input source. The BAV99 diodes are rated at 200mA forward current. Therefore care must be taken to ensure that over-voltage/under-voltage Analog input currents do not exceed 200mA.*

Differential Inputs

Analog input channels 1 & 2 and/or 3 & 4 can be configured together to form 2 differential input channels. When configured as differential inputs Analog input channels 1 and/or 3 are the positive inputs and Analog input channels 2 and/or 4 are the negative inputs.

The diagram below shows the differential Analog input circuit. The circuit includes analog preconditioning networks and a unity gain differential op-amp that produce a scaled 0 to 5 volts output to the ADC.



Circuit details of Differential Analog Input Channel.

It can be seen from the above diagram that the analog preconditioning networks are identical to those in the single ended input circuit diagram on page 46. Therefore the various Analog input mode configurations and jumper settings are the same as for the single ended Analog input circuit.

The op-amp is configured as a unity gain differential amplifier. Jumper J21 selects the input mode as follows:

- When J21 is open the circuit is configured for differential input mode. That is the negative Analog input line is above ground therefore allowing for common mode input voltages up to 10 volts.
- When jumper J21 is closed the circuit is configured for single ended input mode. See page 46 for complete details.

Note *Each of the inputs to the differential Analog inputs are clamped with BAV99 high speed switching diodes to both ground and +15 volts to keep the input voltage to op-amp in the range 0 to +15 volts. Differential and common mode Analog input voltages outside 0 to +15 volts will cause the clamping diodes to conduct and draw current from the Analog input source. The BAV99 diodes are rated at 200mA forward current. Therefore care must be taken to ensure that over-voltage/under-voltage Analog input currents do not exceed 200mA.*

Analog Outputs

The Q22 Module has 2 Analog output channels. These are available at a 9 way connector labeled **'ANALOG I/O'** on the front panel of the Q22

Module. The Analog output channels are numbered 5 & 6. The terminal labeled **'G'** and is a system ground connection. The terminals labeled **'+'** are connected to the switched positive rail of the module's power supply. The 2 Analog output channel have an associated yellow channel status LED to show the state of the associated Analog output channel.

Note Analog channels 5 & 6 can be configured individually as either input or output channels.

Each Analog output channels yellow status LED shows the following channel status:

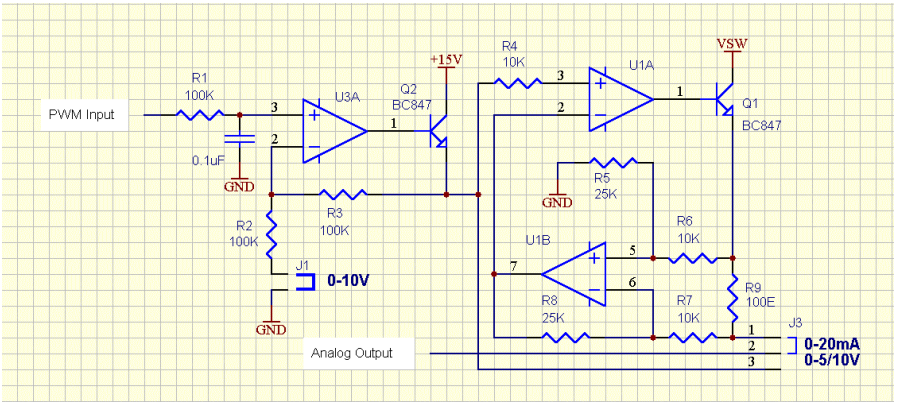
OFF Indicates that the Analog output is at 0V/0mA dependent upon the output mode configured. Or less than 4mA in 4 to 20mA current output mode. That is the DAC count value is zero.

ON Indicates that the Analog output is within the specified voltage or current range dependent upon the output mode configured. That is the DAC value is between 1 and 254 counts.

FLASHING Indicates that the Analog output is at full scale output of 5V/10V/20mA dependent upon the output mode configured. That is the DAC count value is equal to 255, i.e. maximum count.

The 2 Analog output channels can each be individually configured as single ended voltage or current outputs.

The diagram below shows the single ended Analog output circuit. The circuit includes PWM input preconditioning, low impedance 5V/10V voltage output circuit and a voltage to current converter.



Circuit details of Single Ended Analog Output Channel.

The following paragraphs describe the various single ended Analog output configurations:

0 to 5V In this configuration jumper J1 is left open and jumper J3 has pins 2 & 3 closed. The op-amp U3A operates as a unity gain amplifier. Q2 provides low impedance output drive.

0 to 10V J1 is closed and jumper J3 has pins 2 & 3 closed. The op-amp U3A operates as a 2X gain amplifier. Q2 provides low impedance output drive.

0 to 20mA In this configuration jumper J1 is left open and jumper J3 has pins 1 & 2 closed. The op-amp U3A operates as a unity gain amplifier. Op-amps U1A & U1B form a voltage to current converter.

4 to 20mA The 4 to 20mA loop configuration is the same as the 0 to 20mA loop described above, except the central processor scales the output to 4 to 20mA range. This reduces the DAC resolution to 80% of the 256 counts for full scale to 1 part in 205 counts.

Note *When the analog output channels are configured as voltage output channels the output impedance is very low. Output currents in excess of 100mA can damage the transistor Q2.*

Digital to Analog Converter

The Analog outputs are derived from an 8 bit PWM (pulse width modulation) output from the Q03 – 16 Bit Processor. The PWM output is integrated by resistor R1 and the 0.1uF capacitor to produce a 0 to 5 volts DAC output.

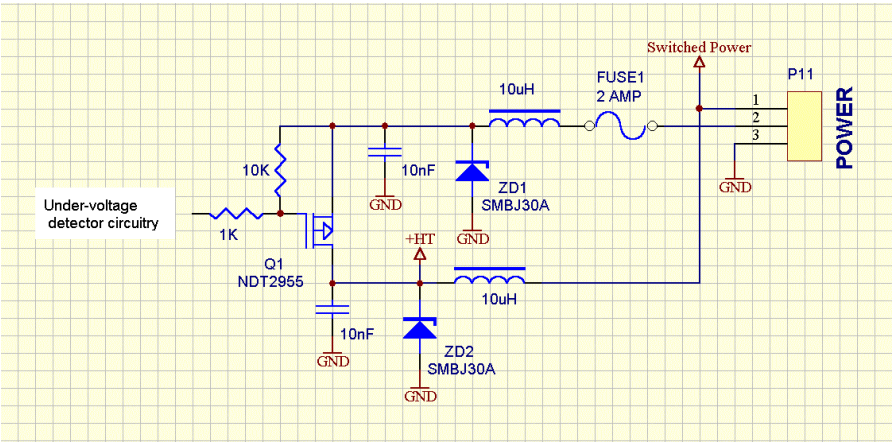
Analog Calibration

To compensate for resistor tolerances and variations together with op-amp gain and offset variations the Q22 Module uses software algorithms to individually compensate and calibrate each Analog channel. The calibration algorithms correct for voltage offset, zero offset and gain offset. The calibration factors are stored in an EEPROM. Analog calibration is performed using the Q22 Configuration & Diagnostic functions.

Power Supply

The Q22 Module is designed to operate with DC power supply voltages of nominally 12 or 24 volt. The Q22 Module will operate on any DC power supply voltage within the range 11 to 28 volts. The Q22 Module draws approximately 90mA at 12 volts and 60mA at 24.0 volts power supply input voltages.

The DC power supply to the Q22 Module must be adequately smoothed and free from noise and voltage transients. Where the DC supply is derived from the AC mains, or batteries with an associated AC mains battery charger these devices must comply with the relevant electrical regulations.



Circuit details of Power Supply Front End.

The above diagram shows the Q22 Motherboard power supply front end circuit. The power supply connector is a 3 way connector labeled **'PWR'** on the bottom panel of the Q22 Module. The connections to the power connector are:

G	Ground, the negative lead of the power supply.
+	The positive lead of the power supply
C	The switched positive output to auxiliary equipment.

In the above circuit diagram the 30 volt transient suppression diode ZD1 and the 2 amp fuse protect the Q22 Module against reversed supply connection, over voltage supply and transient voltages. The fuse is a plug-

in 2 amp TE5 fuse located on the Q22 Motherboard. The fuse is located at the lower right side of the Q22 Motherboard as viewed with the front display panel to the right and the Q03 -16 Bit Processor board removed.

In many applications the Q22 Module is operated from 12V/24V standby battery power supply systems. In the event of the main power supply failing and the battery becoming discharged the Q22 Motherboard has a low battery detection circuit. This circuit turns off the internal power supply of the Q22 Module via Q1 in the above circuit to prevent erratic operation of the Q22 Module and to prevent the battery from being totally discharged. The low battery detection circuit has built in (typically $1/12^{th}$ of the supply voltage) hysterisis to prevent the system repeatedly switching on and off as the battery goes flat.

Jumper J27 is used to select the low battery detection voltage. When J27 is installed the low battery detection is 10.5 volts for a 12 volt battery backed up system. With J27 open the low battery detection is 21 volts for a 24 volt battery backed up system.

The low battery detection modes are:

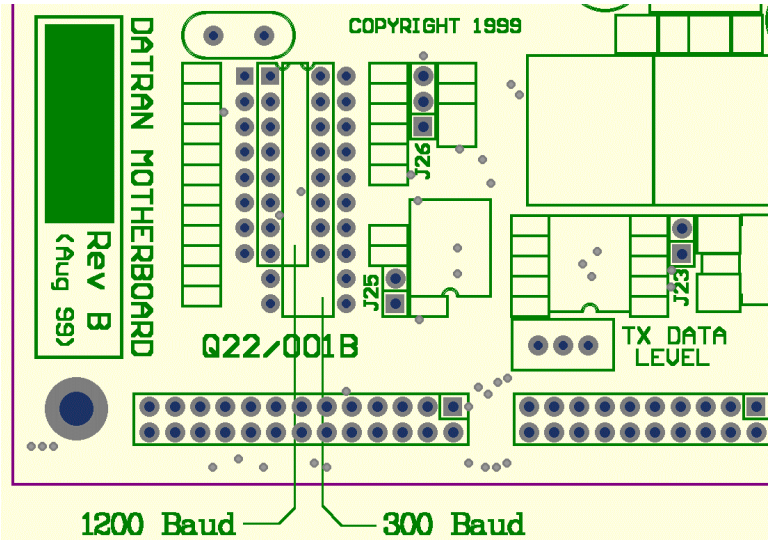
12V Battery OFF at 10.5 volts and back on at 11.5 volts.
24V Battery OFF at 21.0 volts and back on at 23.0 volts.

Modem

The Q22 Motherboard has a built in 300 or 1200 baud modem. This modem is used for radio or direct line communications between the Q22 Module and a base station or specialized communications modules.

Note *The radio modem is not type approved for direct connection to a Telecom line.*

The modem circuitry is located at the bottom of the Q22 Motherboard as viewed with the front display panel to the top and the Q03 -16 Bit Processor board removed. The diagram below shows the modem circuitry.



Location of Modem Circuitry.

The Q22 Motherboard has provision for the installation of either an FX604 1200 baud modem chip, or, an MC145443 300 baud modem chip. Each of these modem chip installations is detailed below.

1200 Baud Modem

In 1200 baud applications of the Q22 Module an FX604 modem chip must be installed in the location shown in the above diagram. The FX604 is a 16 pin DIP package that plugs into the DIP pin headers with the chip offset to the left and pin 1 at the upper left as shown in the diagram above.

The jumpers J23, J25 & J26 must be configured as shown in the table below:

FX604 – 1200 Baud Modem			
	J23	J25	J26
1200 Baud	OPEN	OPEN	1 & 2

300 Baud Modem

In 300 baud applications of the Q22 Module an MC145443 modem chip must be installed in the location shown in the above diagram. The

MC145443 is a 20 pin DIP package that plugs into the DIP pin headers with the chip offset to the right and pin 1 at the upper left as shown in the diagram above.

The jumpers J23, J25 & J26 must be configured as shown in the table below:

MC145443 – 300 Baud Modem			
	J23	J25	J26
Answer	INSTALL	INSTALL	2 & 3
Originate	INSTALL	OPEN	2 & 3

Note *Base station and the slave communications modules are always originate, RTU's are always answer mode.*

Modem Line Level

The modem line transmit level must be setup to suit the modem installed and the application. A multi-turn potentiometer labeled '**TX DATA LEVEL**' is provided on the Q22 Motherboard to set the TX line level. Generally the modem transmit level is set to –3dBm.

The Online Diagnostics & Configuration program is used to set the modem to online and select the modem mark/space transmit modes for setting the modem TX line level. Set the TX DATA LEVEL potentiometer to the required TX level so that the mark and space TX levels swing either side of the required level.

The modem receive level at the line input terminals should be typically –15dBm.

SPECIFICATIONS

Power Supply DC 11 to 28 volts. Current 90mA at 12 volts and 60mA at 24.0 volts.

Low Battery Detect 12V Battery – power OFF at 10.5 volts and back ON at 11.5 volts. 24V Battery – power OFF at 21.0 volts and back ON at 23.0 volts.

Digital Inputs Opto Isolated, ground referenced, current sink inputs. On current 2.5mA at 12 volts supply, 5mA at 24 volts supply. Maximum input voltage not greater than the power supply voltage.

Digital Outputs High voltage current sinks. Maximum sink current 3 amps limited to total 2 amps for all outputs by internal fuse. Outputs clamped to 65 volts, short circuit, over-voltage and thermal overload protected.

Analog Inputs Voltage inputs - 0...5 volts, 0...10 volts. Current inputs - 0…20mA, 4…20mA. Single ended and differential input configurations. Maximum Analog input voltage is 15 volts.

Analog Outputs Voltage outputs - 0...5 volts, 0...10 volts. Current output - 0…20mA, 4…20mA.

WARRANTY & LIABILITY

Subject to the under mentioned exemptions QTech Data Systems Limited undertakes to repair any manufacturing defects and replace or repair any faulty materials within (12) twelve months from the date of sale to the original purchaser.

The exemptions referred to are:

1) Fair wear and tear

2 Faulty installation, misuse, neglect, accident and similar causes.

3) Equipment that does not bear the original Serial Number label or the label has been defaced or altered.

4) Unsuitable operating conditions, including improper installation, and other influences beyond QTech control.

5) Alterations carried out by the Purchaser or any unauthorised third party.

7) Power supply protection parts, including fuses and other circuitry provided to protect the unit from electrical damage.

8) Output drivers, transistors, relays and other parts of the circuitry that are directly connected to third party equipment.

9) Damage resulting from lightening strikes and other static discharges.

Liability for replacements supplied or repairs carried out is limited to the original (12) twelve month warranty period.

QTech will not accept responsibility for warranty work carried out by the purchaser or any unauthorised third party.

QTech does not assume or authorise any person to assume for QTech any other liability regarding its products.

QTech's liability is limited to the extent set out above and does not extend to any consequential damages or losses.

DISCLAIMER

In no event shall QTech nor it respective agents be liable for special, direct, indirect, or consequential damages losses, costs, charges, claims, demands, claims for loss of profit, fees, or expenses of any nature or kind.

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WARRANTY SERVICE

Where the conditions of liability as set out above are met QTech will carry out warranty service as detailed below:

1) Goods returned for servicing shall be adequately packaged to prevent damage in transit and shall be forwarded freight pre-paid.

2) A description of the fault/s together with any other relevant information relating to the fault, together with the return address to which the equipment is to be returned, must be included with any equipment returned to QTech for repair.

3) QTech may elect at its sole discretion to repair or replace equipment returned for repair.

4) Where repairs to the equipment are undertaken, the repairs will be undertaken during normal business hours.

5) Once repairs or replacements are complete, the equipment will be returned by a suitable carrier to the Purchaser unless otherwise instructed by the Purchaser.

OUT OF WARRANTY SERVICE

Where the equipment is outside the (12) twelve month warranty period or is not otherwise covered by the warranty, then the service work will be carried out as detailed above with the exception that all labour, materials and freight will be charged at QTech's rates applicable at the time of service.

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USER'S NOTES